

2. A Note on the Occurrence of a Species of *Phreatothrix* (Vejdovsky) in England, and on some Points in its Structure. By FRANK E. BEDDARD, M.A., F.R.S., F.Z.S., Korresp. Mitgl. d. K. Böhm. Ges. Wiss., &c.

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(Text-figures 76 & 77.)

A few days since Dr. Harmer, F.R.S., was so good as to forward to me a number of worms which had been sent to the Cambridge Museum for identification under the following circumstances:—A gentleman resident near Cambridge has bored a well upon his property, and in the water drawn from this well appeared considerable numbers of an Oligochæte which proves to belong to the genus described some thirty years since by Prof. Vejdovsky, C.M.Z.S.*, from examples supplied to him from a well in Prague. So far as I am aware, that memoir is the only one of recent date which contains any information upon this worm, which appears, however, to have been originally described about one hundred years earlier from the same city. It is clearly therefore a genus which is limited to underground waters; and I am not aware of any other record of its occurrence save those referred to, and that to be communicated in the present report to the Zoological Society of London.

I am therefore able to record the presence of this interesting Lumbriculid in this country for the first time.

The account given of it by Vejdovsky † seems to me, after having carefully examined a number of examples of the living worm, to have included all the chief points in its structure. There remain some minutiae in which I differ from Vejdovsky or supplement him. The differences are, I am inclined to think, due to a difference between the species.

In his account of the species given in his great work upon the Oligochæta ‡, Vejdovsky figures the minute tactile processes which stand stiffly out from the prostomium. I find that these processes are not limited to the prostomium—though doubtless more numerous there than elsewhere,—but occur also even on the seta-bearing segments for some distance back. As I shall bring forward in the sequel some reasons for regarding this species as being hitherto undescribed, this point may be possibly urged as among those which prove this view.

The *setæ* do not appear in their general arrangement or form to differ from those of *Phreatothrix pragensis*. But in one of the examples which I studied (text-fig. 76) I found a persistence of *setæ* on the first segment, which is at least extremely unusual among the

* Zeitschr. wiss. Zool. Bd. xxvii. p. 543 (1876), with preliminary notes in earlier papers quoted by him.

† Zeitschr. wiss. Zool. Bd. xxvii. p. 548.

‡ Syst. u. Morph. d. Oligochæten, Prag, 1834, p. 54.

Oligochæta. On the first segment of one specimen the ventral setæ were evident on both sides of the body, but showed an inequality of development. On the right side there were two setæ, but both of them immature, the immaturity being unequal. One of the setæ was like the "Soies de remplacement" of other segments. It was complete down to the node. The other seta was merely a slender short rod of chitin. On the left side of the body I only found one rudimentary seta, which was like the least developed seta of the right side and merely a short slender rod exactly of the same form and size.

Text-fig. 76.

*Phreatothrix cantabrigiensis*.

Ventral pair of setæ of segment I.

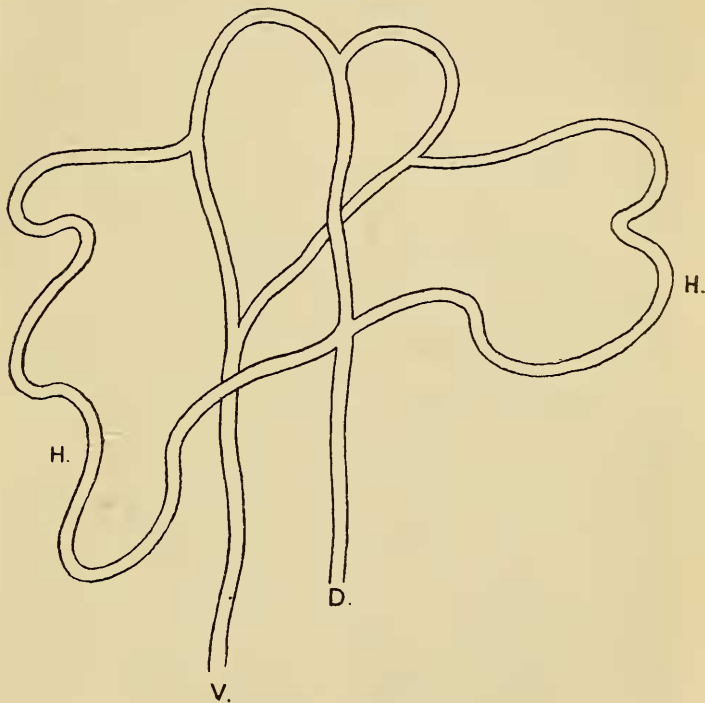
The *vascular system* seems to present certain recognisable differences from that of *Phreatothrix pragensis* described by Vejdovsky, and it is really mainly by reason of this that I venture to create a new species for this *Phreatothrix* from Cambridge. Vejdovsky has figured * the way in which the dorsal vessel ends anteriorly. It appears to bifurcate in the fourth segment and to give off anteriorly to this point three pairs of lateral vessels which join the ventral vessel.

I found in an example, studied with a special view of elucidating the mode of bifurcation of the dorsal vessel, a different arrangement anteriorly. The dorsal vessel (text-fig. 77) divided quite at the anterior end of the body, and the first pair of transverse vessels uniting it with the ventral vessel arose from it some way behind this point of bifurcation. On the other hand, these two lateral vessels joined each half of the ventral vessel formed by the splitting of the dorsal vessel some way before the latter united to form the single ventral blood-vessel. This very considerable difference appears to me to be quite of specific value, and there is hardly room for an error so very considerable, either on my part or on that of the Bohemian Professor.

* Zeitschr. wiss. Zool. t. c. Taf. xxxix. fig. 2.

There is another important point in the structure of the vascular system in which I find that my species does not agree with *Phreatothrix pragensis*. It is characteristic of the latter, as of some other Lumbriculids, that the dorsal vessel in the intestinal region gives off a series of blindly ending transverse appendages, which are contractile. Such structures demand the living worm for their successful demonstration. I examined several specimens with great care in order to ascertain if these characteristic caecal vascular trunks were to be seen; and I utterly failed to see them.

Text-fig. 77.

*Phreatothrix cantabrigiensis*.

Anterior end of dorsal and ventral vascular trunks.

D. Dorsal vessel. | H. "Hearts." | V. Ventral vessel.

I cannot think that they were present in the greater part of the intestinal tract, where I sought them in vain. I have the more confidence in my ability to see these contractile appendages in that I recognised the network of non-contractile vessels upon the gut, which Vejdovsky does not record in *Phreatothrix pragensis*. These vessels formed a close lattice-work upon the gut, quite

similar to that which has been described, for instance, by Štolc in *Lophochaeta**, whose excellent figure of the same has been reproduced by myself in my 'Monograph of the Oligochaeta' †. This system of capillaries was only to be clearly seen during the diastole of the dorsal blood-vessel.

In certain other minutiae of structure the present examples also do not agree with the species *P. pragensis*; for instance, I found in several examples of my species that the investment of chloragogen cells of the alimentary tract commences in segment viii.

Vejdovsky mentions segment xii. as being that in which this investment is first visible in *Phreatothrix pragensis*. Vejdovsky has mentioned that in the living worm the mouth-aperture is seen to be covered with ciliated cells, the cilia being in active motion. It appeared to me that this ciliation in my species extended also on to the prostomium, but certainly not far on to that part of the body. It was in any case very clearly visible in the mouth and just at its outside. This state of affairs was, however, quite unrecognisable in one of the two specimens in which I particularly studied it. It is not very easy to miss actively vibratile cilia in this position, so that I am confident in my assertion that there was no active ciliation in one specimen. Whether this is a variable character in the species or was due to temporary cessation of movement ‡ I am unable to say.

The *nephridia* of *Phreatothrix* are in some ways remarkable. Vejdovsky has pointed out that a single pair may occupy a number of segments. I found precisely the same extension of the nephridia through several segments in the examples which I have studied. There is, however, some difference in the earlier account given by Vejdovsky from the later account of the nephridia of *Phreatothrix pragensis* which is important, in view of the facts which I have noted in the position of the nephridia of my own species of *Phreatothrix*. In the earlier paper on the species (that in the 'Zeitschrift für wissenschaftliche Zoologie') he figures § two pairs of nephridia, a pair in each of segments vii. and viii., each pair only occupying its own segment, though the funnel of course lies in the segment in front. In the 'System und Morphologie der Oligochaeten' || he figures a pair which open, indeed, on to the viiith segment, but which extend back as far as the xivth. These are followed by another pair which open on to the xivth segment, but which extend back as far as the xxist. Both individuals figured are represented as sexually mature. It may be that Vejdovsky had before him examples, not only of *Phreatothrix pragensis* but also of the species with which I deal here, and which I believe to be distinct from that.

I have myself found a nephridium on each side in segment vii. ;

* Abhandl. Böhm. Ges. Wiss. (2) vii. (1889).

† Oxford, 1895, p. 241, fig. 41.

‡ I kept the specimen under intermittent observation for most of a morning, and supplied fresh water at times.

§ *Tom. cit.* pl. xxxix. fig. 2.

|| Pl. xi. fig. 18.

apparently these nephridia are confined to that segment, with the exception, of course, of the funnels. In the following segment, viz., viii., there was another pair of rather smaller excretory glands. A third pair of the same size, or nearly so, were to be found in segment ix. Then followed a gap and the next pair were in segment xv., extending, however, through the two following segments as well—that is to say, three in all, exclusive of the segment which contains the funnel. Further back still a pair of nephridia extended through four segments which I have not mapped accurately. It is clear that in any case this species shows some differences from both accounts given by Vejdovsky. But the facts are not irreconcilable with his earlier account, which, as I have suggested, may refer to the same species which I consider here, or may merely lend evidence to the view that the species varies in the number and position of its nephridia.

The *generative organs* appear to be like those of *Phreatothrix pragensis*, save in one respect. I have, however, examined only a single sexually mature individual. In *Phreatothrix pragensis* there is a second pair of spermathecae in segment xii. rather smaller than those of segment xi. I looked carefully for, but was unable in my species to find, the second pair. I noted the sperm-sacs to lie in segments xi., xii., and xiii. The spermathecae and atria open behind the ventral pair of setae, which are present and have not disappeared. This is quite in accord with Vejdovsky's statements concerning *Phreatothrix pragensis*.

To resume: this species from Cambridge appears to differ from that described by Vejdovsky from Prague in the following points, viz.:—(1) The chloragogen investment of the gut begins in segment vii.; (2) the dorsal and ventral vessels divide to reunite much further forward in the body; (3) there are no contractile appendages of the dorsal vessel; (4) the number and arrangement of the nephridia is somewhat different; (5) the spermathecae of segment xii. have totally disappeared.

It seems to me that we have here a considerable number of differences which warrant the erection of a new species for the worms from Cambridge, which I propose to term *Phreatothrix cantabrigiensis*, or, in accordance with Michaelsen's views*, *Trichodrilus cantabrigiensis*. Possibly this second species with nephridia extending through a considerable number of segments may be regarded as furnishing an argument for reinstating the genus *Phreatothrix*. On the other hand, inasmuch as this character is to be found in *Stylodrilus* † *vejdovskyi*—a species belonging to a genus where there are no contractile appendages to the dorsal vessel,—the question of the generic distinctness of other Lumbriculids is perhaps raised by the facts which I am here able to bring to the notice of the Society.

* Oligochaeta in 'Das Tierreich,' Berlin, Oct. 1900, p. 58.

† Benham, Quart. Journ. Micr. Sci. vol. xxxiii. 1891, p. 42.